Overcrowding

No discussion of the factors contributing to respiratory disease in the child would be complete without some mention of the effect of bad housing and inefficient ventilation in favouring the transmission of infections. The subject is, however, too big to do more than mention it in passing. It is bound up with the problem of housing large numbers of people in comparatively small areas. For this reason the health visitor can often do little or nothing to ameliorate conditions which she knows to be productive of disease.

Pulmonary Fibrosis

Finally, in the list of respiratory diseases of which the predisposing factors are known and to some extent preventable, a place must be found for fibrosis and bronchiectasis. An acute type of bronchiectasis has been described occurring during the active stage of severe broncho-pneumonia; congenital bronchiectasis also occurs, but is rare. Most cases of bronchiectasis are secondary to fibrosis, so that from the preventive point of view it will be sufficient if we consider the causes of fibrosis of the lung. Peri-bronchial fibrosis in varying degrees may follow chronic bronchitis. This may show itself clinically as attacks of cough which last all through every winter, associated often with infected nasal sinuses and tonsils.

But more serious is interstitial fibrosis in which the alveolar structure becomes involved. The two processes are frequently associated, and the distribution and degree are both very variable. Pneumonia, especially broncho-pneumonia, is responsible for the overwhelming majority of cases of this condition. The more chronic the inflammatory process the greater the probability of interstitial fibrosis resulting.

Measles and Whooping-cough

Above all other causes must be set the broncho-pneumonia associated with measles and with whooping-cough. The prevention of these two diseases presents peculiar difficulties, for in both the period of maximum infectivity precedes the appearance of the characteristic diagnostic symptom, the rash of measles and the whoop of whooping-cough. Both diseases are spread by droplet infection, and factors favouring their transmission are overcrowding, with inadequate ventilation. Specific preventive measures offer the best hope of controlling these diseases.

In measles the use of convalescent serum and adult immune serum as means of modifying the severity of the disease has been attended by satisfactory results. The attenuated attack leaves the child with the same measure of active immunity as is achieved by having unmodified measles, and since the serum is of human origin there is little danger of anaphylactoid phenomena. The chief difficulty at present is to get supplies of the serum. One looks forward with interest to the results of the clinical tests, at present proceeding, of the effects of placental extracts in producing a similar attenuation of measles. The results reported in America appear to be satisfactory.

On the efficacy of vaccines and convalescent serum in the prophylaxis of whooping-cough opinion is far from unanimous. My own experience is quite insufficient to put before you, but the reported results of vaccine prophylaxis in America seem to warrant a wider trial of the method in this country.

Conclusion

The successful prophylaxis of respiratory disease in the child is obviously of the greatest importance. The mortality in childhood and the morbidity in later life resulting from these diseases alone are still very high. I have tried to indicate some of the predisposing factors

which must be controlled if this mortality and morbidity are to be lessened. Their control is not entirely, perhaps not even largely, in the hands of doctors or welfare centres. Slums, overcrowding, smoke-abatement, the high cost of living, unemployment—all these things play their part. I suppose we must look to the politicians, with what hope we can muster, for their ultimate correction.

But there are ways in which the present public health services can, if they are intelligently worked, play a part not only in palliating the effects of these various adverse factors, but in educating those in charge of children to make the best of the facilities available.

LEPTOSPIRAL JAUNDICE, FOLLOWING BATHING INJURY

BY

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It has been suggested¹ that all sporadic cases of spirochaetosis icterohaemorrhagica should be reported. The disease appears to be more common than was formerly thought, and present-day methods of diagnosis and treatment can reduce the likelihood of a fatal termination in the severe cases. It is partly for these reasons and partly because the typical symptoms and signs led to the diagnosis being made on clinical grounds, because of the complications met with, and the interesting features in comparison with other reported cases, that this case is reported in detail.

Case Report

A boy of 17, a stripper in the hosiery trade, was admitted to the City General Hospital on August 11th, 1935. He had been on a camping holiday with other boys and woke up one morning with a severe occipital headache; he cycled twelve miles to his home on a very hot day, having a long drink of ice-cold water from a village pump (in regular use) while on the journey. On arriving home he collapsed. At night he had pains in the back and limbs and sweating. Headache on this second day was severe. He was disinclined to take food and on attempting light food vomiting occurred; this had continued up to the time of admission. On the third day the pains became more severe, and on the fourth there was continued epistaxis, which "appeared to ease the headache." He was admitted on the fifth day, when a slight jaundice was noticed. The urine was said to have been of a deeper colour than usual for the last twenty-four hours, and there had been marked constipation for five days.

The patient volunteered the information that he thought he had a splinter in his foot. Inquiry elicited the fact that while camping he had often bathed in a near-by canal. He had got the splinter in his foot during a bathe, two days before the onset of symptoms, when stepping on to the tow-path; he continued bathing after this. He said that rats were numerous and that he had frequently gone rat-catching in this vicinity. He remains quite positive about the length of time between the splinter entering his foot and the onset of symptoms.

CONDITION ON ADMISSION

When first seen on the fifth day his temperature was 101.2° F., his pulse rate 114. His general condition was good, but spasmodically he appeared to be in considerable distress due to limb pains. There was slight jaundice of the skin, the eyes also being icteric, with considerable episcleral hyperaemia. Dried blood was present around the nostrils; the tongue was dry and furred; the throat normal. The blood pressure was 126/80 mm. Hg; no abnormality was detected in the heart and lungs. Examination was unsatisfactory owing to spasms of pain, irregular breathing, and a troublesome hiccup, which had developed in the later part of the day. The abdomen was slightly distended, the liver edge

being just palpable and somewhat tender; the spleen, too, was just palpable. All tendon reflexes were absent in the arms and legs, and no plantar response could be obtained; abdominal reflexes were brisk; the disks were normal. A marked *tache cérébrale* was present. There was intense pain on light palpation in the region of the gastrocnemii, the quadriceps, and to a lesser extent the biceps and deltoid muscles on each side. The sole of the right foot showed a small break in the skin: this was clean and no splinter was present. The urine was acid, contained albumin and bile, and had a specific gravity of 1015. There was no photophobia, neck rigidity, or Kernig's sign; no herpes and no visible haemorrhage other than the epistaxis.

DIAGNOSIS

Diagnosis lay between a jaundice due to an ascending infection, probably from a gastritis, accentuated by the cold drink taken while overheated; epidemic catarrhal jaundice; spirochaetosis icterohaemorrhagica; and some form of toxic jaundice, mushroom poisoning being considered a possibility.

Lumbar puncture performed on admission relieved the headache somewhat, and yielded a clear, colourless cerebrospinal fluid under no increase of pressure. Examination of this fluid proved negative except for a positive mercuric chloride sulphosalicylic acid test (for tuberculous meningitis), which at first complicated the picture. The patient passed a fairly good night after the administration of 2 drachms of paraldehyde, and when seen the next morning (sixth day) was intensely jaundiced. The headache was slightly improved, but the peripheral pains were even more severe. In the afternoon he began talking wildly, and screaming out most of the time, with a few lucid intervals. Hiccup was disturbing and sweating was profuse, necessitating repeated sponging and changing, which further disturbed him, as by this time he could not bear to have his legs even touched. Epistaxis was more marked, a melaenic stool was passed, and there was some difficulty in micturition. The temperature dropped to 97° F. and remained subnormal at about this level until the ninth day. A van den Bergh test gave an immediate direct reaction and a reading of 24 van den Bergh units. Vomiting, though present, was not a marked feature.

On the seventh day the mental condition was improved, but about noon he again became very noisy, being quite unaware of his surroundings. He had passed a very restless night in spite of an increased dose of paraldehyde; epistaxis, hiccup, and pains continued; he was quite unable to move a limb voluntarily. His general condition was now giving rise to great anxiety; the pulse was becoming weaker, and its rate remained between 100 and 120; he would take no nourishment except in the lucid intervals, which were few, and prostration was increasing. Examination on this day showed no change in the liver, but the spleen was no longer palpable. The diagnosis of leptospiral jaundice was made, and it was decided to give serum.

TREATMENT

The patient passed a disturbed night, the general condition apparently becoming worse. Anti-leptospiral serum was given on this eighth day intravenously in doses of 20 c.cm. three times a day up to 120 c.cm., with a considerable improvement noticeable by evening. No complaint was made of pain, the mental condition improved, and nourishment was taken; the pulse became stronger; a van den Bergh reaction gave an immediate direct response and a figure of 60 van den Bergh units. Microscopical examination of the urine on this day showed renal epithelial debris, pus cells, red blood cells, and granular casts.

A good night's sleep, without a sedative, was disturbed only by epistaxis. There was no hiccup, and only one epistaxis during the day; the temperature reached normal for the first time; the van den Bergh was recorded again as 60 units. Examination showed the liver enlargement unaltered and reflexes still absent; there was, however, slight voluntary movement of the ankles. On the tenth day there was a further improvement in the general condition; there was no epistaxis, and the van den Bergh figure was 60 units again. On the eleventh day, after a further night's rest without recourse to sedatives, the patient complained of some pain in the left side of the abdomen; examination revealed friction in the mid-axillary line near the subcostal margin;

the pain was relieved by strapping the chest. Reflexes were still absent even on reinforcement, sensation being normal.

On the twelfth day there was a marked decrease in the jaundice to the naked eye; a van den Bergh test gave 40 units. The stools ceased to be melaenic and were clay-coloured. The thirteenth day showed a further decrease in jaundice, and the van den Bergh was 14 units. The albuminuria, present since admission, cleared, and the following day a twenty-four-hour specimen of urine was alkaline for the first time. The urine showed pus cells, red blood cells, many granular casts, and motile organisms. On the fifteenth day the blood urea was 48 mg. per 100 c.cm. An electrocardiogram was normal, the P-R interval being 0.2 second, the limit of normality. On the sixteenth day a van den Bergh estimation gave 8 units.

Treatment generally was by glucose and lemon drinks, when possible; paraldehyde was given up to the commencement of the serum treatment, after which no sedative was needed; no morphine was prescribed in view of the apparent liver damage and the serious condition of the patient. The serum used was horse serum prepared from a human strain of *L. icterohaemorrhagiae*. On the eighth day potassium citrate and hyoscyamus were given, the vomiting having lessened.

COMPLICATIONS AND CONVALESCENCE

On the seventeenth day a relapse occurred, complaint being made of headache; the temperature rose to 100° F. in the evening. The next day vomiting began again, the temperature remained raised, and albuminuria returned, the urine becoming acid in reaction, but free of bile for the first time. On the nineteenth day, in addition to the headache and vomiting, there was pain in the back and photophobia. Epistaxis recurred, and there was no obvious change in the disappearing jaundice. The temperature had reached 103.8° F., but fell gradually (being normal for twenty-four hours on the twenty-ninth day). On the twentieth day the epistaxis and vomiting continued, and a lumbar puncture was performed, which did not relieve the headache, although the vomiting became less pronounced. The cerebrospinal fluid was yellow and clear, with seven lymphocytes per c.cm. and a positive mercuric chloride sulphosalicylic acid test. The abdomen was slightly distended, the liver still moderately enlarged, with no enlargement of the spleen; reflexes were still absent. The cerebrospinal fluid urea was 31 mg. per 100 c.cm. On the twenty-second day the blood urea was 50 mg. per 100 c.cm., and the urine contained a large number of pus cells, a few red blood cells, many renal epithelial cells, and an occasional *B. coli*. Improvement was made until the twenty-fourth day, when diarrhoea developed; this responded to lavage. The van den Bergh estimation was 4 units. On the following day he had the last epistaxis, and from this time onwards made progress.

Ankle-jerks were elicited and knee-jerks on reinforcement on the twenty-ninth day, this being the first response to repeated examinations. The temperature had then been normal for twenty-four hours. On the thirty-first day a thrombophlebitis of the left median basilic vein developed, which settled satisfactorily on treatment. This vein was last used for the collection of blood at least fifteen days previously. On the thirty-seventh day urinary examination showed an occasional pus cell and red blood cells, no granular casts, and no organisms. On the forty-third day the blood urea was 19 mg. per 100 c.cm., and a urea clearance test gave a renal efficiency estimation of 94 per cent. of normal function. The albuminuria cleared on the forty-ninth day, and did not return. Weakness was still very marked at this time. The hair came out in considerable quantities during convalescence.

The patient was discharged fit on November 10th, 1935, having gained 1 st. 11 lb. in weight in the previous five weeks.

Guinea-pig Inoculations

Typical leptospiral jaundice was reproduced in three guinea-pigs. The inoculation details are as follows:

1. *Sixth Day*.—2 c.cm. of citrated blood inoculated intraperitoneally; result negative. It was established subsequently that a considerable period elapsed between the taking of the blood and the inoculation.

2 and 3. *Fifth Day*.—2 c.cm. of urine, acid in reaction, injected intraperitoneally (two guinea-pigs); both negative.

4. *Tenth Day*.—2 c.cm. of urine (intraperitoneally) killed the guinea-pig eleven days after inoculation; result—positive. The twenty-four-hour specimen of urine on the previous day was neutral in reaction.

5. A liver emulsion from No. 4 was injected intraperitoneally; the animal died thirteen days later; result—positive.

6. A liver emulsion from No. 5 was injected intraperitoneally, and though the guinea-pig died eight days later the result was negative.

7. *Thirteenth Day*.—A specimen of urine, acid in reaction, was forwarded to London, where Dr. Alston examined it by dark-ground illumination; result—negative. He also inoculated a guinea-pig by scarification, with a negative result.

8. *Fifteenth Day*.—2 c.cm. of urine, alkaline in reaction, were inoculated intraperitoneally; result—positive.

9. *Twenty-third Day*.—2 c.cm. of urine, acid in reaction, were injected intraperitoneally; result negative.

10. *Twenty-fourth Day*.—2 c.cm. of urine, acid in reaction, intraperitoneally, again gave a negative result.

Dr. Alston also examined the tissues taken from guinea-pig No. 6 by dark-ground illumination, with, not unnaturally, a negative result.

BLOOD COUNTS

Day	7th	10th	20th	25th	39th
Red cells	3,750,000	3,310,000	2,750,000	2,670,000	3,990,000
Haemoglobin	82%	70%	42%	59%	82%
White cells	15,280	14,400	14,400	7,400	8,500
Polymorphs	82%	64%	70%	70%	50%
Monocytes	3%	6%	5%	6%	2%
Lymphocytes	14%	28%	25%	24%	45%
Others	1%	2%	—	—	3%

Discussion

A severe case of spirochaetosis icterohaemorrhagica is described, the disease having been reproduced with typical lesions in guinea-pigs from two separate specimens of urine and from infected guinea-pig tissue. The typical guinea-pig lesions leave no doubt as to the diagnosis. The inability to demonstrate the leptospirae themselves with certainty must be attributed to lack of experience and of the necessary apparatus. In sections made from the infected guinea-pigs several suspicious fields were seen in the liver, kidneys, and lungs, but could not be definitely identified. The urine examined by Dr. Alston was negative, as was the guinea-pig tissue examined by him; this animal, however, showed no signs of the disease post mortem. The polymorphonuclear leucocytosis mentioned by Buchanan² is emphasized by Findlay, Dunlop, and Brown³ as a feature of this disease, as opposed to the leucopenic tendency with a relative lymphocytosis met with in epidemic catarrhal jaundice.

The source of infection in this case would appear to be from the canal mud through the skin by means of the break caused by the splinter, the skin being an accepted portal of entry. It should be noted that this patient always entered the water by diving, and that he used the "crawl" stroke; his head was under water, therefore, for a considerable time, and infection may have developed in this manner. The patient, questioned afterwards, was positive that he had never swallowed any of the water, and stated that he had bathed in the same canal, at about the same site, on many previous occasions, the only difference on this occasion being that the splinter

entered his foot. He had been in camp for five days, bathing each day, before returning home. If the skin is accepted as the portal of entry the incubation period of the present case is two days; this is an unusually short time, for Shuffner⁴ found that the incubation period in cases arising from bathing averaged ten days, the minimum time being four days. This time is also given by Watson and others.⁵ It may be possible that the fact that the patient had little or no resistance to the infecting organism, as evidenced by the severity of the illness and the response to serum, may have shortened the incubation period.

Clinically the disease was typical, although severe. There was the sudden onset of headache, limb pains, vomiting, and fever, followed by "red eyes" and jaundice, with an associated pyelonephritis. A feature not present in this case, but mentioned by Halsted,⁶ Littledale,⁷ Watson,⁸ Davidson and others,⁹ is sore throat. There was no herpes. Features of the jaundice were the rapidity of its development and disappearance and its intensity. On the sixth day the number of van den Bergh units was 24; on the eighth, 60; on the tenth, 60; on the twelfth, 40; on the thirteenth, 14; and on the sixteenth, 8. Alston¹⁰ gives a figure of 54 units; for three days at least this boy maintained a figure of 60 units. There was an almost complete absence of itching, one complaint only being made. During the relapse there was no visible change in the jaundice, though the van den Bergh measurements showed a steady decline; the relapse began on the seventeenth day and lasted till the twenty-ninth, the measurement on the sixteenth day being 8 units and on the twenty-fourth 4 units.

The limb pains were very distressing; they came at first in spasms, and later whenever he was touched. He was quite unable to move his legs at one time, and the tendon reflexes were an alarmingly long time in returning. I have seen no reference in the literature to the length of time required for their return. Davidson and others⁹ mention pains in the severe cases as "a very prominent symptom," and Fairley¹¹ describes two cases with pains, in one of them "excruciating." Usually, however, this degree of severity would appear to be uncommon. In view of the normal sensation the lesions would appear to be in the anterior horn cells or in the afferent fibres, and one or other may be temporarily damaged by the toxins.

Relapses, according to Buchanan,² occur in 10 per cent. of cases. In this case the first symptom of the relapse was on the seventeenth day. Price,¹² quoting Dawson, says: "In some instances there is a secondary rise of fever about the beginning of the third week which is difficult to explain, since there is no accompanying exacerbation of symptoms or increase of jaundice." In the present case, however, there was a return of all symptoms, pain being referred to the back rather than to the limbs, but there was no increase of jaundice.

Of the value of serum, so far as one can form an opinion from one case, there would appear to be little doubt. From the comparisons given above and the condition of the patient before serum was given, I feel convinced in my own mind that it saved his life. In the case described by Halsted serum appears to have been very beneficial; Davidson and others¹³ state that it should be given before the icteric stage, preferably during the first three days. From the present case and that of Halsted it would appear that serum can be very beneficial when given much later.

This patient also developed the other complication met with in the disease, a pyelonephritis which developed early in the illness. Albuminuria was present from admission until the forty-ninth day, except on the fifteenth,

sixteenth, and seventeenth days, just before the relapse, on which three days the urine was alkaline. Davidson and others¹⁴ emphasize the importance of a nephritis in association with jaundice in the diagnosis of the disease. The pleurisy which developed on the eleventh day does not appear to be a common complication. The thrombophlebitis was not at first regarded as a complication of the disease, in spite of the long interval between its development and the last occasion on which venupuncture was performed. A case is reported,¹⁵ however, in which phlebitis developed in the leg on the thirty-second day. In the present case it developed in the arm on the thirty-first day.

Neutralization of the urine when looking for leptospirae is advocated by Morgan and Brown,¹⁶ and it is significant that in the present case the successful guinea-pig inoculations were performed, first with a urine which had been neutral in the twenty-four-hour specimen immediately preceding, and the second with an alkaline urine. All the other urine inoculations were unsuccessful, and were with an acid urine. The specimen sent to Dr. Alston was also acid. It would seem, therefore, quite apart from other reasons, that the administration of potassium citrate or some such preparation is necessary if successful inoculations are to be made from urine. Davidson and others¹³ state that the inoculation must take place within one hour; two or three hours elapsed in the successful inoculations in the present case. The progressive anaemia up to the twenty-fifth day should be noted. Buchanan² states that the disease is accompanied by a slight anaemia, with a haemoglobin percentage of 70 to 90. Two of the cases described by Alston¹⁰ had a haemoglobin percentage of 50; the haemoglobin in the present case descended to 42.

No high blood ureas, like that of Alston's¹⁰ second case, in which the blood urea reached 145 mg. per 100 c.cm., were recorded. The highest figures were 48 mg. per 100 c.cm. on the fifteenth day, and 50 mg. during the relapse. The nephritis is toxic, and appears to leave no permanent effects. The boy is fit and well and working at the present time.

The final point of interest concerns the mercuric chloride sulphosalicylic acid test for tuberculous meningitis. This test would appear to be not infallible, as a positive result was obtained from both specimens of cerebro-spinal fluid examined.

My thanks are due to Dr. E. C. Hadley, medical superintendent of the City General Hospital, for permission to publish this case, and to Dr. Alston for his interest and his very valuable assistance.

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Clinical Memoranda

Mixed Salivary Tumour of Hard Palate

The following case of mixed salivary tumour of the hard palate came into St. Mary's Hospital some weeks ago. I consider this case interesting on account of the effusion into the maxillary antrum.

A married woman aged 64 years was admitted to hospital on April 16th. She complained of a large swelling over the left maxillary antrum, which started two and a half years ago and which had grown gradually bigger. Her doctor put a needle in on two occasions and drew off some blood-stained fluid.

On examination of the mouth the teeth were found to be normal, but on the front of the hard palate there was a rubbery, hard, irregular swelling, which had the appearances of a carcinoma. No secondary glands were felt. A radiograph revealed an effusion into the left maxillary antrum, together with bone and expansion. An operation was performed, at which the swelling was excised and the antrum drained. The wound healed by first intention.

The pathological report was that of mixed salivary gland tumour showing the usual structure of fibrous tissue and various types of epithelium, tubes with columnar cells, a few alveoli containing colloid, drawn-out cells in a mucinous matrix, and squamous keratinized epithelium. There was no evidence to suggest that the tumour was more malignant than usual.

I wish to thank Mr. Duncan Fitzwilliams for permission to publish this case.

GORDON WILLIAMS,
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Muscle Irritability Preceding Ether Convulsions

The reason for publishing this case is the very interesting occurrence of the twitching of the abdominal muscles when clipped at least fifteen minutes before convulsions commenced. This phenomenon was not noticed when the original incision was made.

If local irritability of muscle should be found constantly to precede late ether convulsions this sign would be a useful warning to the anaesthetist, as the anaesthetic could be changed and ether eliminated before convulsions actually start.

A boy 12 years old was admitted to hospital with a diagnosis of acute appendicitis. He was of good build and height for his age. Temperature 97° F., pulse 72. Half an hour before the operation, which was performed by the house-surgeon, he had an injection of 1/100 grain atropine sulphate, but no other premedication apart from this.

Induction was rapid and smooth by means of a nitrous oxide, ethyl chloride, ether sequence. Anaesthesia was maintained by means of the open ether drip method, and after about fifteen minutes, when slight duskiness appeared, oxygen was continuously run in under the mask.

So many adhesions were found that after twenty-five minutes the incision had to be lengthened by 1½ inches in order to get better access. At this stage the respirations began to get shallow and jerky, and lacked the even rhythm one associates with deep anaesthesia, yet my experience told me that the patient ought to be in the deeper planes of the third stage of anaesthesia. I now asked the operator whether relaxation was good, and he replied that he was quite satisfied, but that the muscles twitched when he clipped them with artery forceps.

When the operation had been in progress for three-quarters of an hour I lifted the gamgee pad from the face and noticed slight twitching of both eyelids. This soon spread to the other facial muscles, and one could hear his teeth clicking against the metal end of the Phillips airway. The muscles of the neck now twitched, his head jerking from side to side, and movements of the shoulders soon followed. At the